

What is Claimed:

1. A stent delivery system comprising:
an inner tube comprising a proximal end and a distal end, the inner tube being disposed within an outer tube with an annular space disposed therebetween, the distal
5 end of the inner tube further comprising a distal tip,
the outer tube comprising a proximal end and a distal end, the distal end of the outer tube being disposed proximally to the distal tip of the inner tube,
a heating element positioned around the inner tube proximal to the distal tip thereof,
10 the distal end of the outer tube being connected to a balloon which extends between the distal end of the outer tube and the distal tip of the inner tube, the balloon overlying the heating element.
2. The stent delivery system of claim 1 further comprising an expandable
15 stent positioned around the balloon and disposed between the distal end of the outer tube and the distal tip of the inner tube.
3. The stent delivery system of claim 1 wherein the heating element
20 comprises a coil.
4. The stent delivery system of claim 1 wherein the balloon is also
connected to the distal tip of the inner tube.
5. The stent delivery system of claim 1 wherein the stent is crimped onto
25 the balloon.
6. The stent delivery system of claim 1 wherein the stent comprises
nitinol.
- 30 7. The stent delivery system of claim 1 wherein the stent is a self-expanding stent.

8. The stent delivery system of claim 1 wherein the balloon comprises an elastomeric material.

5 9. The stent delivery system of claim 1 wherein the distal tip of the inner tube is tapered.

10 10. The stent delivery system of claim 1 wherein the inner tube comprises a distal radiopaque marker disposed immediately proximal to the distal tip and a proximal radiopaque marker disposed immediately distal to the distal end of the outer tube.

11. The stent delivery system of claim 1 wherein the distal tip of the inner tube having a maximum outer diameter that is equal to or greater than a maximum outer diameter of the stent in an unexpanded form.

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12. The stent delivery system of claim 1 wherein the heating element is connected to a power line and a return line that extends along the inner tube to the proximal end thereof.

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13. The stent delivery system of claim 12 wherein the heating element , power line and return line are encased in a layer of insulating material.

14. A method of deploying an expandable stent in a vasculature system comprising:
- providing a stent delivery system comprising
- an inner tube comprising a proximal end and a distal end, the inner tube being disposed within an outer tube with an annular space disposed therebetween, the distal end of the inner tube further comprising a distal tip,
- the outer tube comprising a proximal end and a distal end, the distal end of the outer tube being disposed proximally to the distal tip of the inner tube, the distal end of the outer tube being connected to a balloon which extends between the distal end of the outer tube and the distal tip of the inner tube,
- a cylindrical expandable stent disposed around the balloon and disposed between the distal end of the outer tube and the distal tip of the inner tube,
- the distal tip of the inner tube having a maximum outer diameter that is equal to or greater than a maximum outer diameter of the stent in an unexpanded form;
- inserting the stent delivery system, with the stent in the unexpanded form, into the vasculature system and to a desired position;
- heating the stent to expand the stent and causing it to adhere to the vasculature system at the desired position;
- deflating the balloon; and
- withdrawing the inner and outer tubes and balloon from the vasculature system.
15. The method of claim 14 wherein during the heating of the stent the balloon is heated and partially inflated.
16. The method of claim 14 wherein the stent is a self-expanding stent and during the inserting step, the balloon and stent are cooled.
17. The method of claim 14 wherein the cooling is performed using cool saline solution delivered through the annular space and into the balloon.

18. The method of claim 14 wherein the heating is performed using warm saline solution delivered through the annular space and into the balloon.

19. The method of claim 14 wherein the heating is performed using a heating element.

20. The method of claim 19 wherein the heating element comprises a coil connected to a power line that extends along the inner tube to the proximal end thereof and the current is supplied to the heating element through the power line.

21. The method of claim 19 wherein a thermocouple is disposed on the distal end of the inner tube and the method further comprises monitoring temperature during the heating step.

22. The method of claim 14 wherein the stent delivery system further comprises a protective sheath disposed over the stent and the method further comprises removing the protective sheath prior to the inserting step.

23. A stent delivery system comprising:
an inner tube comprising a proximal end and a distal end, the inner tube being disposed within an outer tube with an annular space disposed therebetween, the distal end of the inner tube further comprising a tapered distal tip, a heating element positioned on the distal end of the inner tube and proximal to the distal tip,
the outer tube comprising a proximal end and a distal end, the distal end of the outer tube being disposed proximally to the distal tip of the inner tube, the distal end of the outer tube being connected to a balloon which extends between the distal end of the outer tube and the distal tip of the inner tube, the balloon at least partially overlying the heating element,
the balloon also being connected to the distal tip of the inner tube, the balloon being disposed within and engaging a cylindrical expandable stent which overlies the balloon and is disposed between the distal end of the outer tube and the distal tip of the inner tube.

24. The stent delivery system of claim 23 wherein the stent is crimped onto the balloon.

25. The stent delivery system of claim 23 wherein the stent comprises
5 nitinol.

26. The stent delivery system of claim 23 wherein the stent is a self-expanding stent.

10 27. A method of deploying an expandable stent in a vasculature system comprising:

providing a stent delivery system comprising

an inner tube comprising a proximal end and a distal end, the inner tube being disposed within an outer tube with an annular space disposed

15 therebetween, the distal end of the inner tube further comprising a tapered distal tip,

a heating element being positioned on the distal end of the inner tube and proximal to the distal tip,

the outer tube comprising a proximal end and a distal end, the distal end of the outer tube being disposed proximally to the distal tip of the inner tube, the
20 distal end of the outer tube being connected to a balloon which extends between the distal end of the outer tube and the distal tip of the inner tube, the balloon at least partially overlying the heating element, the balloon also being connected to the distal tip of the inner tube,

the balloon being disposed within and engaging a cylindrical expandable stent
25 which overlies the balloon and is disposed between the distal end of the outer tube and the distal tip of the inner tube,

inserting the stent delivery system, with the stent in the unexpanded form, into the vasculature system and to a desired position;

30 heating the balloon and the stent by supplying current to the heating element while at least partially inflating the balloon to expand the stent and causing it to adhere to the vasculature system at the desired position.

28. The method of claim 27 further comprising:
deflating the balloon; and
withdrawing the inner and outer tubes and balloon from the vasculature
system.

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29. The method of claim 27 wherein the stent is a self-expanding stent and
during the inserting step, the balloon and stent are cooled.

30. The method of claim 27 wherein the cooling is performed using cool
10 saline solution delivered through the annular space and into the balloon.

31. The method of claim 27 wherein a thermocouple is disposed on the
distal end of the inner tube and the method further comprises monitoring temperature
during the inserting and heating steps.

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32. The method of claim 27 wherein the stent delivery system further
comprises a protective sheath disposed over the stent and the method further
comprises removing the protective sheath prior to the inserting step.